FORM PTO-1390 (REV 10-2000) U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE

TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371

ATTORNEY'S DOCKET NUMBER	
P-1800-US	
U.S. APPLICATION NO. (If known, see 37 CFR 1.5)	09/807892

INTERNATIONAL APPLICATION NO.	INTERNATIONAL FILING DATE	PRIORITY DATE CLAIMED
PCT/IL99/00554	21 October 1999	22 October 1998

TITLE OF INVENTION A METHOD FOR DELIVERING A DEVICE TO A TARGET LOCATION

APPLICANT(S) FOR DO/EO/US MERON, Gavriel ; IDDAN, Gavriel J.

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☒ This is an express request to promptly begin national examination procedures (35 U.S.C. 371(f)).
4. ☒ The US has been elected by the expiration if 19 months from the priority date (PCT Article 31).
5. ☒ A copy of the International Application as filed (35 U.S.C. 371(c)(2))
   a. ☒ is attached hereto (required only if not communicated by the International Bureau).
   b. ☐ has been communicated by the International Bureau.
   c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).
6. ☐ An English language translation of the International Application as filed (35 U.S.C. 371(c)(2))
7. ☐ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3)).
   a. ☐ are attached hereto (required only if not communicated by the International Bureau).
   b. ☐ have been communicated by the International Bureau.
   c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
   d. ☐ have not been made and will not be made.
8. ☐ An English language translation of the amendments to the claims under PCT Article 19 (35 U.S.C 371(c)(3))
9. ☒ An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).
10. ☐ An English language translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).

Items 11. to 16. below concern document(s) or information included:

11. ☐ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
12. ☐ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
13. ☐ A FIRST preliminary amendment.
    ☐ A SECOND or SUBSEQUENT preliminary amendment.
14. ☐ A substitute specification.
15. ☐ A change of power of attorney and/or address letter.
16. ☒ Other items or information: 1) Postcard
    2)
    3)

JC03 Rec'd PCT/PTO 19 APR 2001

U.S. APPLICATION NO. (If known, see 37 CFR 1.5)	INTERNATIONAL APPLICATION NO.	ATTORNEY'S DOCKET NUMBER
09/807892	PCT/IL99/00554	P-1800-US

17. ☒ The following fees are submitted:

	CALCULATIONS PTO USE ONLY	
BASIC NATIONAL FEE (37 CFR 1.492 (a) (1) - (5):		
Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO **$1000.00**		
International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO **$860.00**		
International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO **$710.00**		
International preliminary examination fee paid to USPTO (37 CFR 1.482) but all claims did not satisfy provisions of PCT Article 33(1)-(4) **$690.00**		
International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(1)-(4) **$100.00**		
ENTER APPROPRIATE BASIC FEE AMOUNT =	$ 690.00	
Surcharge of **$130.00** for furnishing the oath or declaration later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492(e)).	$	

CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE		
Total claims	23 - 20 =	3	X $18.00	$ 54.00	
Independent claims	4 - 3 =	1	X $80.00	$ 80.00	
☐ MULTIPLE DEPENDENT CLAIM(S) (if applicable)			+ $270.00	$	
			TOTAL OF ABOVE CALCULATIONS =	$ 824.00	
☐ Applicant claims small entity status. See 37 CFR 1.27. The fees indicated above are reduced by ½.				$	
			SUBTOTAL =	$ 824.00	
Processing fee of **$130.00** for furnishing the English translation later than ☐20 ☐30 months from the earliest claimed priority date (37 CFR 1.492(f)).			+	$	
			TOTAL NATIONAL FEE =	$ 824.00	
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). $40.00 per property +				$	
			TOTAL FEES ENCLOSED =	$ 824.00	
			Amount to be refunded:	$	
			charged:	$ 824.00	

a. ☐ A check in the amount of $_____ to cover the above fees is enclosed.

b. ☒ Please charge my Deposit Account No. 05-0649 in the amount of $824.00 to cover the above fees. A duplicate copy of this sheet is enclosed.

c. ☒ The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 05-0649. A duplicate copy of this sheet is enclosed.

Note: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO:

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42,425
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WO 00/22975 PCT/IL99/00554

A METHOD FOR DELIVERING A DEVICE TO A TARGET LOCATION

FIELD OF THE INVENTION

The present invention relates to a method for identifying a target location in the gastrointestinal tract and for direct delivery of a device to the identified location.

BACKGROUND OF THE INVENTION

In the gastrointestinal tract, the stomach is connected, through the small intestine, a long tube that folds many times to fit inside the abdomen, to the large intestine. There are numerous pathologies of the gastrointestinal tract, such as lesions causing chronic gastrointestinal tract blood loss, which occurs in about 2% of US adults, malignancies, most of which give a poor prognosis, and bowel obstructions; simple, closed-loop, strangulated and incarcerated. Some of these pathologies, such as small intestinal tumors, are difficult to diagnose. Diagnostic methods of the small intestine are usually symptom related or invasive, such as barium enemas or surgery. New methods of diagnosis can lead to an earlier diagnosis and improved prognosis.

US patent number 5,604,531 describes an *in vivo* video camera system which can image the gastrointestinal tract. Reference is now made to Fig. 1, which is a block diagram illustration of a prior art *in vivo* video camera system for imaging the gastrointestinal tract. The *in vivo* video camera system typically comprises a swallowable capsule 10 for viewing inside the digestive system and for transmitting

video data, a reception system 12 typically located outside a patient, and a data processor 14 for processing the video data. The data processor 14 typically operates two monitors, a position monitor 16 on which the current location of the capsule 10 within the digestive system is displayed and an image monitor 18 on which the image currently viewed by the capsule 10 is displayed.

The reception system 12 can either be portable, in which case, the data it receives is temporarily stored in a storage unit 19, prior to its processing in data processor 14, or it can be stationary and close to the data processor 14.

Reference is now made to Figs. 2 and 3 which are a schematic illustration of calculations performed by a prior art data processor for processing the video data obtained by the above *in vivo* video camera system. Fig. 2 is a front view illustration of the patient 22 with an antenna array 30 wrapped around him. On it, four antennas 34a - 34d are noted. Antennas 34a and 34b are located in a column at one side of the patient 22 and antennas 34c and 34d are located in a column at the other side of the patient 22.

Since the strength of a signal received by any given antenna depends on its distance from and angle to the transmitter, the ratio of the signal strengths between any two antennas, which have the transmitter between them, is constant along a curve which intersects the location of the transmitter. Thus, antennas 34a and 34b define curve 30a and antennas 34c and 34d define curve 30b.

The intersection of curves 30a and 30b is the location of the transmitter which is the location of the capsule 10. The curves 30a and 30b are typically determined in a calibration step for a pre defined number of constant values.

The designation of antennas 34a - 34d depends on and is determined from the width L_1 of the patient 22, which value is typically provided to data processor 14 (of Fig. 1). Alternatively, there can be a plurality of antenna arrays 30, one for each of a pre-defined number of widths L_1. The antennas 34a - 34d are then constant for each antenna array 30.

The location of the capsule 10, thus generated, is typically denoted by a two-dimensional vector **P**, having a length P and an angle □, from the center point O of an X-Y coordinate system.

The cross-sectional location (within an X-Z plane) of the capsule 10 can also be determined using a similar calculation to that illustrated in Fig. 2. A cross-section of the patient 22 is illustrated in Fig. 3. For this determination, four antennas 34e -34h, which are opposite in a cross-sectional manner, are utilized.

Once again, the ratio of the signal strengths between two antennas, which have the transmitter between them, is constant along a curve which intersects the location of the transmitter. Thus, antennas 34e and 34h define curve 30c and antennas 34f and 34g define curve 30d.

The location of the capsule 10 thus generated is typically denoted by a two-dimensional vector **Q** having a length Q and an angle □, from the center point O.

The two vectors **P** and **Q** are combined to determine the three-dimensional location of the capsule 10. The location can be displayed two- or three-dimensionally on position monitor 16 (of Fig. 1), typically, though not necessarily, as an overlay to a drawing of the digestive tract.

There exist methods for the delivery of medicament to a selected site in

the gastrointestinal tract, such as the use of time delivery capsules made of material that dissolves in a particular environment and/or within a particular time period, within the gastrointestinal tract. In these methods, the delivery of medicament is dependent on the predictability of the particular environment to which the capsule is directed.

Controllable apparatuses for delivery of medicaments are described in US patents 5,558,640 and 4,239,040. While using these apparatuses or capsules the delivery of medicament may be obstructed, such as by folds in the intestine.

These methods can not be relied upon for localized release of a medicament.

US patent 5,279,607 describes a method of obtaining directional data from the passage of an ingestible radio signal transmitting capsule. This data is subsequently compared to directional data from a capsule carrying medicament passing through the alimentary canal, for remotely triggering the release of medicament at a calculated geometric location along the gastrointestinal tract. A location selected in this method, cannot be aligned with sites of interest, such as pathologies, since no diagnostic information, such as information relating to the pathology, can be obtained in this method. Furthermore, due to the constant peristaltic movement of the alimentary canal, the geometric location of a site is not the same in a first and second pass, so that this one parameter is only partially sufficient for selection of a site.

There exist no medicament delivering systems which combine diagnostic and therapeutic processes.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide a method for delivering a utility device to a target location in the gastrointestinal tract. The method combines identification of a target in the gastrointestinal tract and delivery of a utility device to the identified target location. The method of the present invention comprises the steps of:

a) generating a map of the gastrointestinal tract, employing a sensing and utility device for a first pass, or, optionally, a plurality of passes through the gastrointestinal tract; and

b) delivering the sensing and utility device to a target location identified on the map, using the sensing and utility device in a second pass or, optionally, a plurality of passes, through the gastrointestinal tract. The sensing and utility device used in the second pass, may be the same or different than the device used in the first pass.

The term "sensing and utility device", in the present invention, refers to a device which is swallowable or placeable (such as described in IL patent application number 122716, assigned to the common assignees of the present invention and which is hereby incorporated by reference), and is capable of sensing selected parameters of the gastrointestinal tract. The device also comprises means for performing a job in the gastrointestinal tract. It is controllable and is capable of being monitored and of generating a map of the gastrointestinal tract.

The sensing and utility device may comprise, for example, any one or any combination of a video camera, which generates an image of the

gastrointestinal tract, or sensing means, such as temperature, pressure or pH sensors or means for sensing the presence of blood, microorganisms, parasites or pathological indications or any objects alien to the gastrointestinal tract.

Means for performing a job may be any means suitable for researching, diagnosing or treating pathologies in the gastrointestinal tract, for example, fluid or cell sampling means, marker releasing means or medicament releasing means.

A map of the gastrointestinal tract may be generated by inserting the sensing and utility device into the gastrointestinal tract, monitoring the progress of the device through the gastrointestinal tract and optionally displaying the locations, two or three dimensionally, on a position monitor.

Monitoring the device is by periodically or repeatedly locating the device, preferably, as described in US patent number 5,604,531 assigned to the common assignees of the present invention. US 5,604,531 is hereby incorporated by reference.

Delivering the sensing and utility device to a target location identified on the map comprises the steps of inserting the sensing and utility device into the gastrointestinal tract, in a second pass, receiving data from the device, either visual, from a video camera, or from the output of other sensing means, performing signal analysis of the data generated in the first pass and the data received from said sensing and utility device in the second pass; and controlling, such as by IR or telephony, the sensing and utility device according to the signal analysis.

The method of the present invention may be used for research, diagnostic or therapeutic purposes in the gastrointestinal tract .

BRIEF DESCRIPTION OF THE FIGURES

The present invention will be understood and appreciated more fully from the following detailed description taken in conjunction with the drawings in which:

Fig. 1 is a block diagram illustration of a prior art *in vivo* video camera system for imaging the gastrointestinal tract;

Figs. 2 and 3 are schematic illustrations of calculations performed by a prior art data processor for processing the video data obtained by the *in vivo* video camera system for imaging the gastrointestinal tract, utilizing an antenna array, wherein Fig. 3 is a top view illustration of the antenna array and Fig. 2 is a cross-sectional illustration of the antenna array.

Fig. 4 is an illustration of a sensing and utility device according to a preferred embodiment of the invention;

Fig. 5A is an illustration of a storage compartment, according to a preferred embodiment of the invention, in a recoiled position of the bi stable spring;

Fig. 5B is an illustration of a storage compartment, according to a preferred embodiment of the invention, in an extended position of the bi stable spring;

Fig. 5C is an enalrgement of the storgae compartment tip, according to a preferred embodiment of the invention;

Fig. 6 is an illustration of a sensing and utility device operable according to a preferred embodiment of the invention; and

Fig. 7 is an illustration of a generated and displayed map in the method according to a preferred embodiment of the invention.

DETAILED DESCRIPTION OF THE INVENTION

The method of the present invention combines diagnostic and therapeutic processes. For example, the method combines identifying and localizing a pathology in the gastrointestinal tract with administrating treatment to the location of the pathology, by non invasive means. This combination is provided by employing a sensing and utility device which is inserted into the gastrointestinal tract, either by swallowing it or by placing it in the gastrointestinal tract. The above mentioned IL patent application 122716 describes a device for the placement of an autonomous capsule in the gastrointestinal tract, which bypasses the need for swallowing the capsule by the patient.

Reference is now made to Fig. 4 which is an illustration of a sensing and utility device according to a preferred embodiment of the invention. The sensing and utility capsule shaped device, generally referenced 40, typically comprises a light source 42, a viewing window 44, through which the light illuminates the inner portions of the digestive system, a camera system 46, such as a charge-coupled device (CCD) or CMOS camera, which detects the images, an optical system 48 (typically comprising a mirror 47 and a focusing lens 47') which focuses the images onto the CCD or CMOS camera system 46, a transmitter 41, which transmits the video signal of the CCD or CMOS camera system 46, a power source 43, such as a battery, which provides power to the entirety of electrical elements of the capsule and a storage compartment 45, for the controllable discharge of medicaments or markers or for the controllable collection of fluid or cell samples from the environment, such as in a biopsy procedure.

The sensing and utility device can additionally include any known sensor

element 49 such as temperature, pressure or pH sensors or means for sensing the presence of blood, microorganisms, parasites or pathological indications or any objects alien to the gastrointestinal tract.

Reference is now made to Figs. 5A, 5B and 5C which are illustrations of a storage compartment, according to a preferred embodiment of the invention.

Storage compartment 55 is located preferably at an end of the sensing and utility device, generally referenced 50. The storage compartment is defined by an inflexible barrier 59 and the device shell. The storage compartment contains a pouch 56 made of flexible material which is encased by the device outer shell 52 and by a firm diaphragm 54 having an elasticity which will allow it to accommodate to a capsule shape. Diaphragm 54 is horizontally movable between the inflexible barrier 59 and the device tip. At the device tip there is an area 58, in the outer shell of the device, which is permeable and which allows passage of substances from or into the pouch 56. Permeability may be conferred, for instance by the area 58 being porous or sieve like. The pouch 56 is designed to retain substances such as releasable medicaments or markers or such as fluid or cell samples from the gastrointestinal tract environment. The pouch 56 bulk is determined by a bi stable spring 53, preferably made of a memory shape metal such as TiNi. The spring 53 is attached, at one end to the solid barrier 59, and at its other end, to the diaphragm 54. The spring 53 may be made to extend (as shown in Fig. 5B) or recoil (as shown in Fig. 5A) by providing different temperatures, as known in the art (the means for providing different temperatures, such as conducting wires, are not shown). Thus, the pouch 56 bulk may be reversably increased or decreased.

Fig. 5A illustrates a piercing pin 57 which is attached to the pouch wall

and which protrudes into the pouch 56 inner space, in the direction of the opposing pouch wall 56'. For releasing a substance from pouch 56 into the gastroinestinal tract environment, spring 53 is made to extend, causing diaphragm 54 to move towards the device end, thrusting the peircing pin 57 into the opposing pouch wall 56', rupturing it. A substance contained in the pouch 56 will be released into a space 51 provided between the opposing pouch wall 56' and the outer shell permeable area 58. The released substance may then pass through the openings in the permeable area 58 into the gastrointestinal tract.

Fig 5B illustrates a pouch 56 meant for collecting a sample from the gastrointestinal tract. In this embodiment the bi stable spring 53 is lodged in opposing pouch wall 56'. The spring 53 is made to recoil, pulling with it diaphragm 54 and piercing pin 57, such that piercing pin 57 is dislodged from the opposing pouch wall 56', rupturing it and leaving an opening in the pouch, through which substances from the environment are drawn into the pouch 56. The opening in the pouch is sealed after the sample is drawn in from the environment, ensuring a fixed volume and sterility of the collected sample.

Pin 57 may be a hollow cylinder through which substances may pass to or from the gastrointestinal tract.

Fig. 5C is an enlargement of the device end, through which substances are drawn into, or released from, the pouch. As can be seen in this figure, space 51 is provided, ensuring that the pin 57, either before being dislodged from wall 56' for collecting substances, or when piercing wall 56' for release of substances, doesn't protrude further than the device shell 52 and injure the patient's insides.

Reference is now made to Figs. 6 and 7. Fig. 6 is an illustration of a sensing and utility device operable according to a preferred embodiment of the invention, and Fig. 7 is an illustration of a map of the gastrointestinal tract generated in the method, according to a preferred embodiment of the invention.

Capsule 60 moves through the gastrointestinal tract 62 in a first pass to generate, by visual means, a map of the gastrointestinal tract and to identify, by visual means or other sensor means, a location of interest in the gastrointestinal tract. In its second pass, capsule 60 moves through the gastrointestinal tract and is controlled to perform a job at the identified location.

Recognition of the location, identified in the first pass, is done , in analyzing unit 65, by analysis of the map generated in the first pass and bringing into conformity parameters, visual or others, obtained in the first pass and in the second pass. This may be acheived by any of the well known techniques of image matching by correlation, as done in image analysis, or any other suitable signal analysis techniques.

As the capsule 60 moves through the digestive system (gastrointestinal tract) 62, in its first pass, it views the walls of the digestive system in the method described in Figs. 2 and 3 and in US 5,604,531, and transmits the resultant images to a reception system 64 typically located outside a patient. The reception system 64 receives a multiplicity of versions of the images, each version received by a different antenna (described in Figs. 2 and 3) and either stores the received signals in the storage unit 68 or provides the received signals, directly, by IR or telephony, to the data processor 66. The data processor 66 typically operates two monitors, a position monitor 63, on which the current location of the capsule 60

within the digestive system is recorded, and, optionally, displayed and an image monitor 61, on which the image currently viewed by the capsule 60 is displayed.

The reception system 64 can either be portable, in which case, the data it receives is temporarily stored in a storage unit 68 prior to its processing in data processor 66, or it can be stationary and close to the data processor 66.

The capsule 60 location can be displayed two- or three-dimensionally on position monitor 63, typically, though not necessarily, as an overlay to a drawing of the digestive tract. The progress of capsule 60 is monitored by repeated or periodic localization of the capsule, and can be displayed on position monitor 63.

A forward filming device can be distinguished from a backwards filming device by the flow direction of the image. Information relating to the direction of the device motion enables more precise localization of the storage compartment end of the device. Furthermore, analysis of the optical flow enables to calculate the device velocity in the gastrointestinal tract.

The repeated localizations generate a map of the route taken by the capsule in the gastrointestinal tract 62. The generated map 70 is shown in Fig. 7. For maximum accuracy, images displayed on image monitor 61 are compared with the generated map 70 displayed on position monitor 63 to identify the location of a pathology 72, though, a location may be identified by analysis of parameters other than visual (such as pH, temp, etc.), which were sensed during the first pass in the gastrointestinal tract.

Upon identifying the location of a pathology 72 on the gastrointestinal tract map 70, either visually or by analysis of other sensor means input, capsule 60 is inserted into the gastrointestinal tract for a second pass. As capsule 60

moves through the digestive system 62, in its second pass, it is monitored as above. When arriving at the location of the pathology 72, or at any other point on map 70, determined as the point for advantageously releasing medicament for the treatment of the pathology, the capsule 60 is controlled to release the medicament from the medicament storage compartment of the capsule (45 in Fig. 4). The release of the medicament may be autonomous, automatically controlled by analyzing unit 65 or remotely controlled by an external operator.

It will be appreciated by persons skilled in the art that the present invention is not limited by what has been particularly shown and described herein above. Rather the scope of the invention is defined by the claims which follow:

CLAIMS

1. A method of delivering a sensing and utility device to a target location in the gastrointestinal tract comprising the steps of:

generating a map of the gastrointestinal tract employing a sensing and utility device for a first pass through the gastrointestinal tract; and

delivering said sensing and utility device to a target location identified on said map using said sensing and delivering device in a second pass.

2. The method according to claim 1 wherein the sensing and delivering device is a capsule comprising;

sensing means for generating data in a first and second pass through the gastrointestinal tract;

means for signal analysis of the data generated in the first and second pass;

means for controlling the sensing and utility device according to said signal analysis; and

means for performing a job in the gastrointestinal tract.

3. The method according to claim 1 wherein the step of generating a map of the gastrointestinal tract comprises the steps of :

inserting the sensing and utility device into the gastrointestinal tract;

locating said sensing and utility device; and

displaying the location on a position monitor.

4. The method according to claim 3 further comprising a step of displaying the location of the device two or three dimensionally.

5. The method according to claim 4 wherein the location of the device is displayed as an overlay to a schematic presentation of the gastrointestinal tract.

6. The method according to claim 1 wherein the step of delivering the sensing and utility device to a target location identified on the map generated in the first pass, comprises the steps of :

inserting the sensing and utility device into the gastrointestinal tract, in a second pass;

receiving data from said sensing and utility device;

performing signal analysis of the data generated in the first pass and of the data generated in the second pass; and

controlling said sensing and utility device according to said signal analysis.

7. The method according to claim 1 wherein the first pass and second pass are one or more passes.

8. The method according to claim 1 wherein the target location is a location of a pathology.

9. A sensing and utility device for performing a job at a target location in a gastrointestinal tract comprising:

sensing means for generating data in a first and second pass through the gastrointestinal tract;

means for signal analysis of the data generated in the first and second pass;

means for performing a job in the gastrointestinal tract; and

means for controlling the sensing and utility device and the means for performing a job, operable according to said signal analysis.

10. The device according to claim 9 wherein the sensing means sense parameters of the gastrointestinal tract in a first and second pass and wherein the means for signal analysis analyze the sensed parameters.

11. The device according to claim 10 wherein the means for controlling the sensing and utility device are operable according to the analysis of the sensed parameters in the first and second pass.

12. The device according to claim 9 wherein the means for performing a job in the gastrointestinal tract are selected from means for releasing substances into the gastrointestinal tract and means for collecting substances from the gastrointestinal tract.

13. A system for delivering a sensing and utility device to a target location in the gastrointestinal tract comprising:

a sensing and utility device consisting of:

a camera system;

an optical system for sensing an area of interest onto said camera system;

a transmitter which transmits video output of said camera system; and

means for performing a job in the gastrointestinal tract;

a reception system which receives said transmitted video output, said reception system comprising;

an antenna array capable of surrounding a body and comprising a plurality of antennas for receiving said transmitted video output and for producing a plurality of received signals;

a demodulator capable of transforming said plurality of received video signals into a single video data stream; and

a data processing system which generates tracking and video data from said single data stream;

and

an analyzing unit for signal analysis of said video output and for controlling the sensing and utility device.

14. The system according to claim 13 wherein the sensing and utility device is swallowable.

15. The system according to claim 13 wherein the sensing and utility device is placeable in the gastrointestinal tract.

16. A storage compartment, enclosed in a sensing and utility device, for releasing and collecting substances to and from the gastrointestinal tract, having an inflexible barrier as a first wall, and said device shell as a second wall, said second wall opposing said first wall, and comprising:

a flexible pouch for retaining said substances, said pouch encased within said inflexible barrier and device shell;

a bi stable spring attached to the inflexible barrier, at one end, and to the flexible pouch at another end, for controlling the pouch bulk; and

means for changing the bi stable spring configuration, for extending the spring to decrease pouch bulk and for recoiling the spring to increase pouch bulk.

17. The storage compartment according to claim 16 further comprising a firm diaphragm, having elasticity which enables it to accommodate to a device shape, and which is horizontally movable between the inflexible barrier and device shell, said diaphragm situated at the attachment site of the bi stable spring and the flexible pouch, and attached to both flexible pouch and bi stable spring, for pushing or pulling the flexible pouch relatively to the compartment walls.

18. The storage compartment according to claim 17 further comprising means for rupturing the flexible pouch for releasing a substance from said pouch to a patient's gastrointestinal tract and for collecting into said pouch substances from a patient's gastrointestinal tract.

19. The storage compartment according to claim 18 wherein the device shell contains an area which is permeable to the released and collected substance.

20. The storage compartment according to claim 19 wherein the means for rupturing the flexible pouch is a pin, said pin being attached to a first pouch wall while protruding in the direction of a second pouch wall, said second pouch wall being opposed to said first pouch wall,

and wherein the pin is thrust into the second pouch wall to rupture it for releasing a substance from the pouch.

21. The storage compartment according to claim 19 wherein the means for rupturing the flexible pouch is a pin, said pin being attached to a first pouch wall while being lodged in a second pouch wall, said second pouch wall being opposed to first pouch wall,

and wherein, for collecting a substance into the pouch, the pin is dislodged from the second pouch wall and moved in the direction of the first pouch wall, rupturing said second pouch wall.

22. The storage compartment according to claims 20 and 21 further comprising a space between the second pouch wall and the device shell for containing a pin tip protruding through the second pouch wall, for protecting a patient's gastrointestinal tract from the protruding pin tip.

23. Use of the method according to claim 1 for research, diagnostic or therapeutic purposes.

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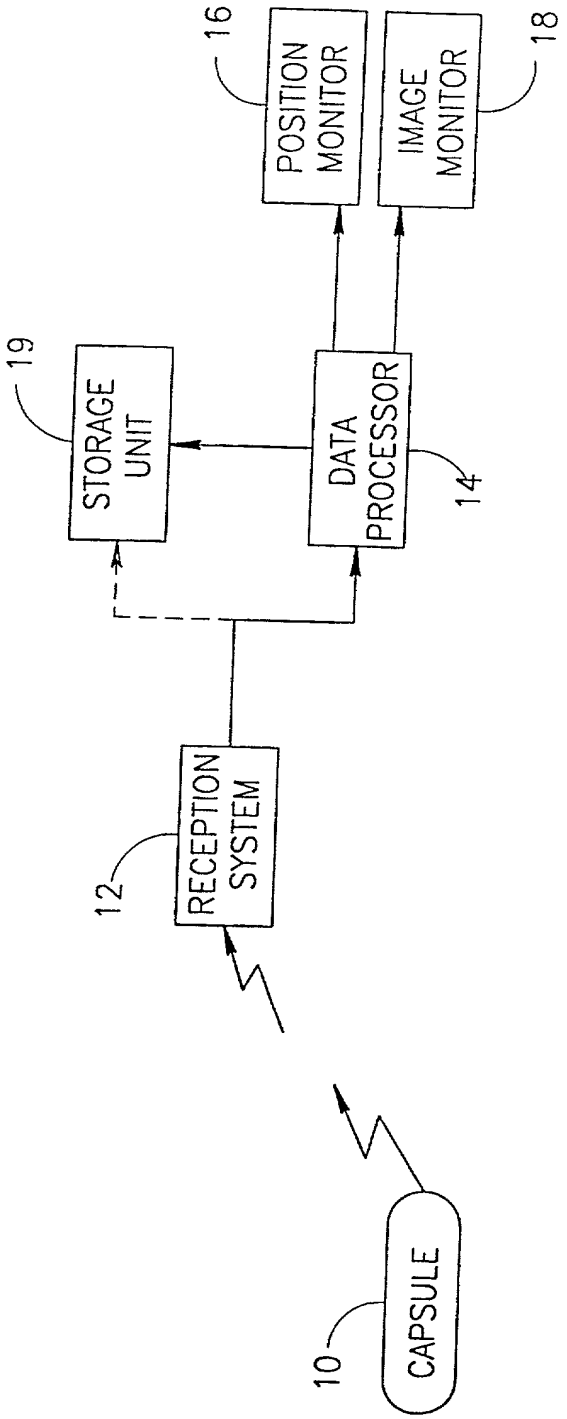

FIG.1

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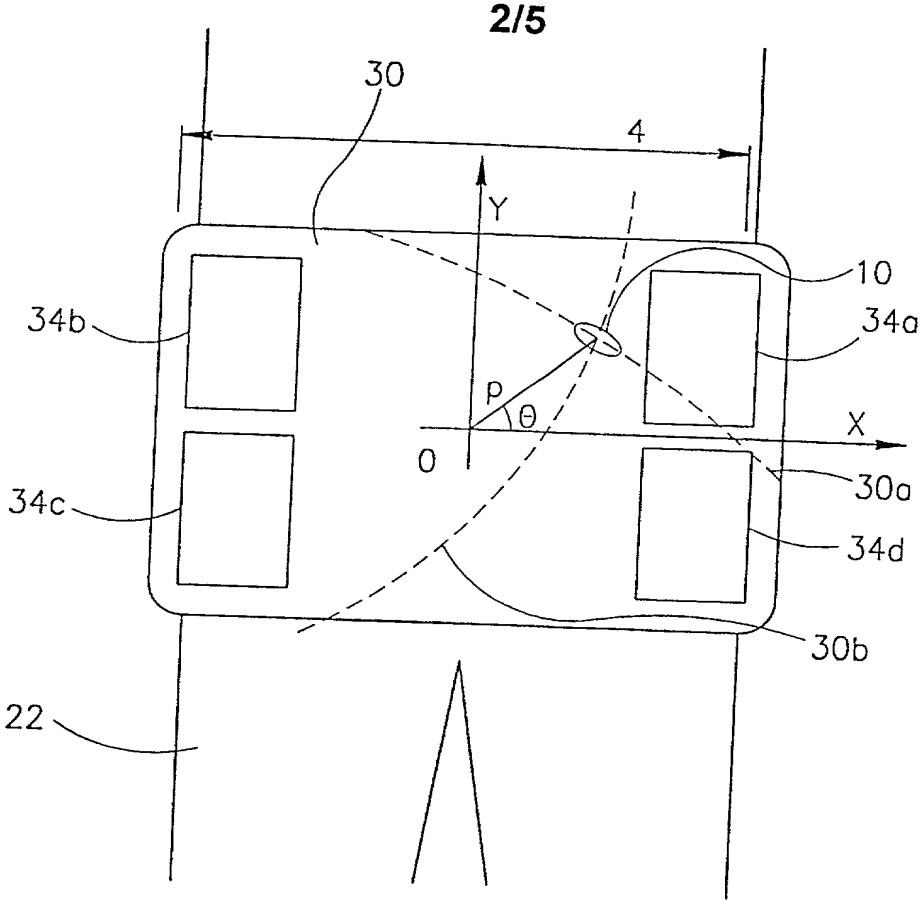

FIG.2

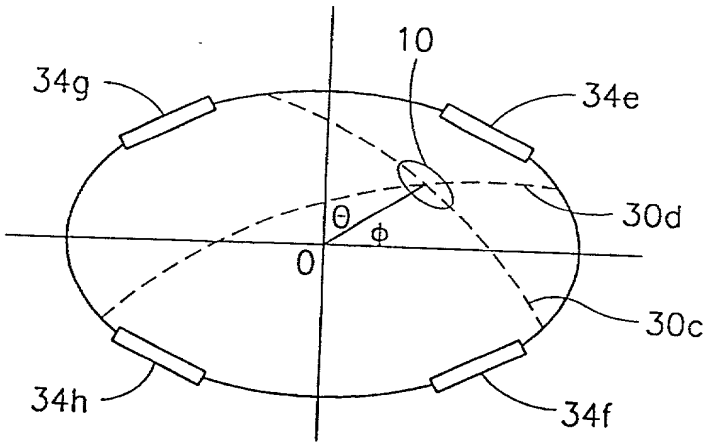

FIG.3

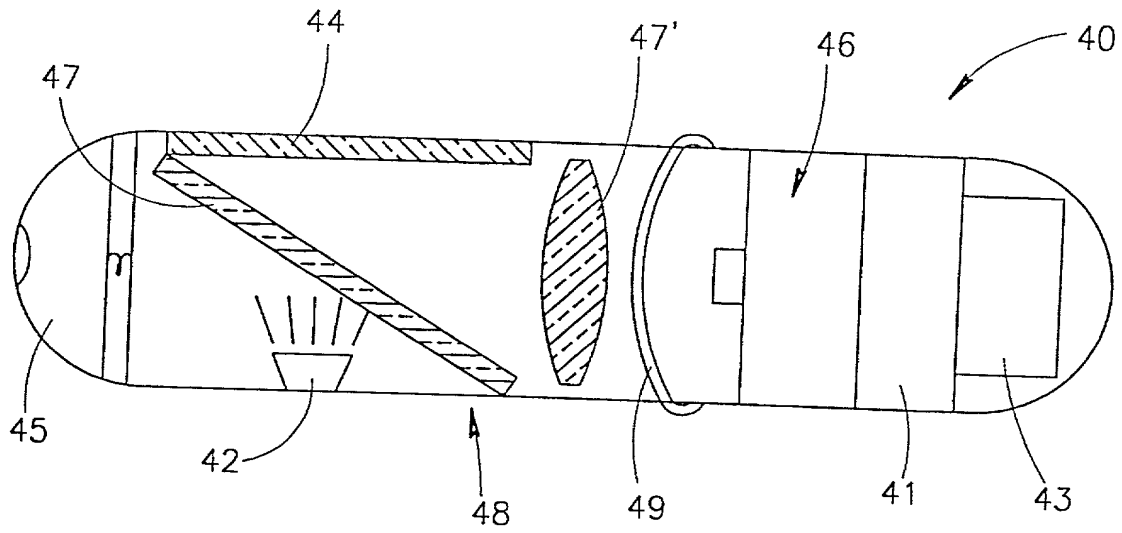

FIG.4

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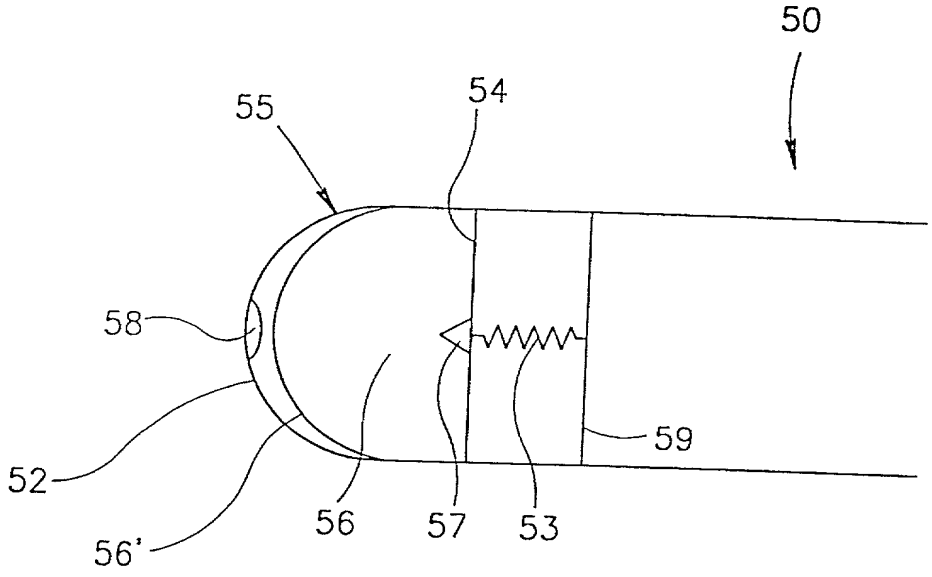

FIG.5A

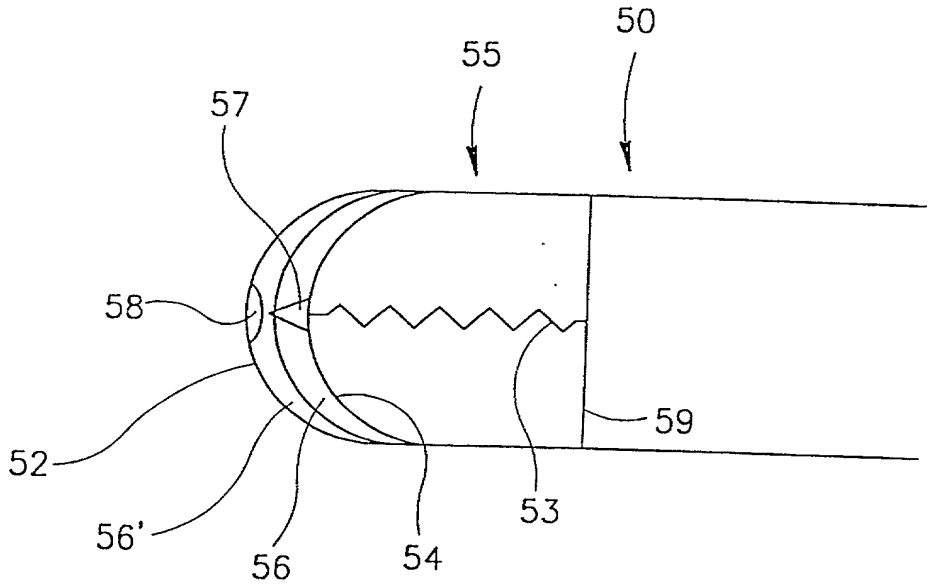

FIG.5B

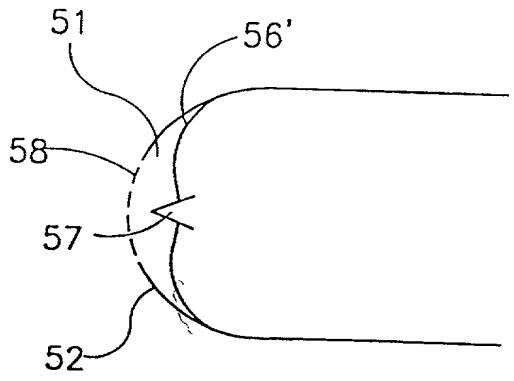

FIG.5C

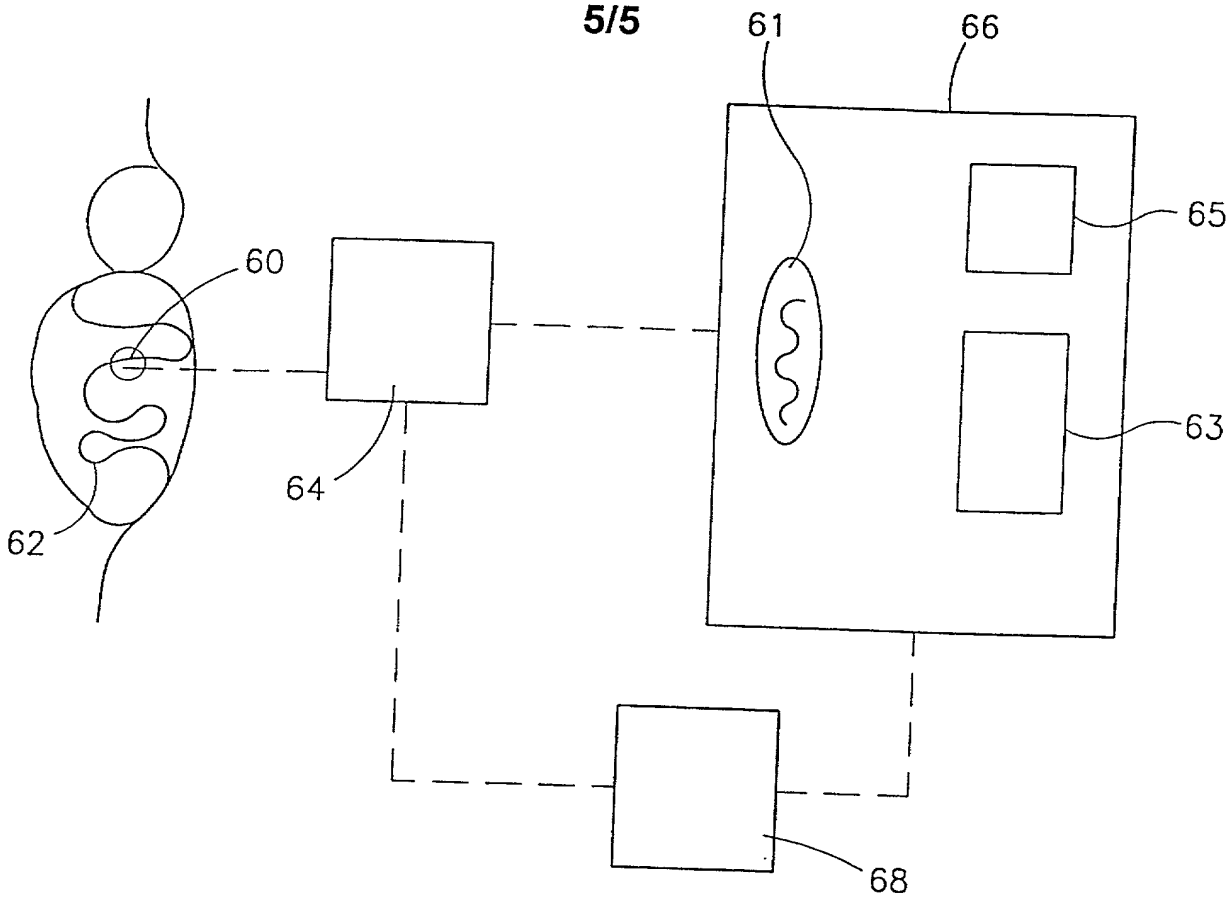

FIG.6

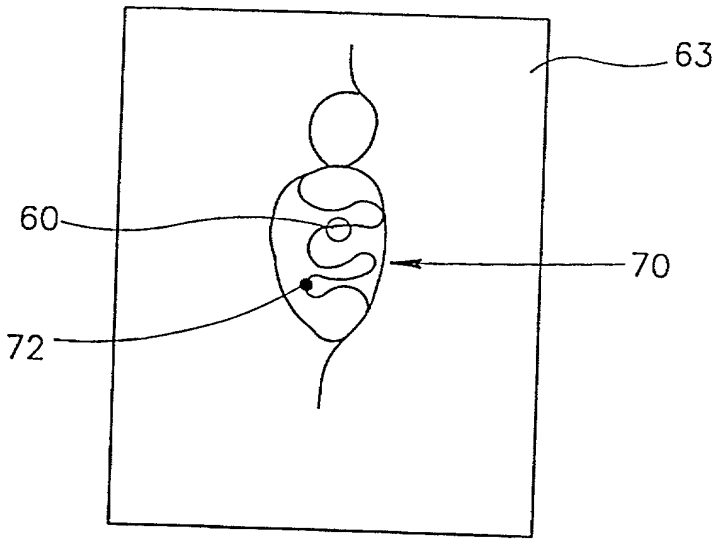

FIG.7

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DECLARATION AND POWER OF ATTORNEY FOR PATENT APPLICATION

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below under my name.

I believe that I am the original, first and sole inventor of the subject matter which is claimed and for which a patent is sought on the invention entitled

A METHOD FOR DELIVERING A DEVICE TO A TARGET LOCATION

the Specification of which

☐ is attached hereto
☒ was filed on **21 October 1999**
as United States Application Number or PCT International Application No. **PCT/IL99/00554**
and was amended on _____ (if applicable).

I hereby state that I have reviewed and understand the contents of the above-identified Specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, 1.56(a).

I hereby claim foreign priority benefits under Title 35, United States Code, §119 of any provisional application filed in the United States in accordance with 35 U.S.C. §1.119(e), or any application for patent that has been converted to a Provisional Application within one (1) year of its filing date, or any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed.

PRIOR FILED APPLICATION(S)

APPLICATION NUMBER	COUNTRY	(DAY/MONTH/YEAR FILED)	PRIORITY CLAIMED
126727	**IL**	**22 October 1998**	**YES**
PCT/IL99/00554	**PCT**	**21 October 1999**	**YES**

I hereby claim the benefit under Title 35, United States Code, §120 of any United States application listed below, and, insofar as the subject matter of each of the claims of this application is not disclosed in any prior United States application in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, §1.56(a), which occurred

Attorney Docket No.: **P-1800-US**

between the filing date of the prior application and the national or PCT international filing date of this application:

APPLICATION NO.	FILING DATE (DAY/MONTH/YEAR)	STATUS - PATENTED, PENDING, ABANDONED
126727	**22 October 1998**	**Pending**
PCT/IL99/00554	**21 October 1999**	**Expired**

I hereby appoint as my attorney(s) and agent(s) Heidi M. Brun (Agent, Registration No. 35,104), or Daniel J. Swirsky (Agent, Registration No. 45,148) or Mark S. Cohen (Attorney, Registration No. 42,425) or Rochel L. Abboudi (Agent, Registration No. 44,490) or Suzanne Erez (Agent, Registration No. 46,688) or Vladimir Sherman (Attorney, Registration No. 43,116) or David Klein (Agent, Registration No. 41,118) said attorney(s) and agent(s) with full power of substitution and revocation to prosecute this application and transact all business in the Patent and Trademark Office connected therewith.

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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further, that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

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SIGNATURE OF INVENTOR X _____

DATE X 17 May 2001

Attorney Docket No.: **P-1800-US**

2-00

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SIGNATURE OF INVENTOR X Gavriel Iddan

DATE X May 29 2001